



King's Research Portal

DOI:

[10.1017/S174413311800018X](https://doi.org/10.1017/S174413311800018X)

Document Version

Peer reviewed version

[Link to publication record in King's Research Portal](#)

Citation for published version (APA):

Tan, S., Wu, X., & Yang, W. (2018). Impacts of the type of social health insurance on health service utilisation and expenditures: implications for a unified system in China. *Health economics, policy, and law*.
<https://doi.org/10.1017/S174413311800018X>

Citing this paper

Please note that where the full-text provided on King's Research Portal is the Author Accepted Manuscript or Post-Print version this may differ from the final Published version. If citing, it is advised that you check and use the publisher's definitive version for pagination, volume/issue, and date of publication details. And where the final published version is provided on the Research Portal, if citing you are again advised to check the publisher's website for any subsequent corrections.

General rights

Copyright and moral rights for the publications made accessible in the Research Portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognize and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the Research Portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the Research Portal

Take down policy

If you believe that this document breaches copyright please contact librarypure@kcl.ac.uk providing details, and we will remove access to the work immediately and investigate your claim.

Impacts of the type of social health insurance on health service utilisation and expenditures: implications for a unified system in China

Introduction

Social health insurance (SHI) has expanded rapidly as a leading health financing tool and has increased health population coverage to many health systems around the world, including an increasingly large number of developing countries (Hsiao and Shaw, 2007). For instance, the beneficiaries of Popular Health Insurance (PHI) in Mexico, one of the leading performers in SHI expansion among developing countries, increased from 5.2 million in 2004 at its launch, to 52.5 million in 2012 (Rivera-Hernandez and Galarraga, 2015). Likewise, in China, individuals with SHI made up less than 15% of the population in 1998 when SHI schemes were first introduced in the formal employment sector and; by 2011, coverage had extended to 95% (Yu, 2015). More importantly, such expansion has occurred not only in terms of the breadth of coverage in the population but also in the comprehensiveness of benefit packages and increased reimbursement rates (Wang et al., 2014).

One of the unintended consequences of this phenomenal expansion is the segmentation of the SHI system across different population covered. In the case of China, for instance, there are three separate schemes for different groups: the Urban Employee Medical Insurance (UEI) scheme covers urban residents with formal employment, the Urban Resident Medical Insurance (URI) scheme covers the urban unemployed, and the New Cooperative Rural Medical Insurance Scheme (NCMS) covers rural residents. Based primarily on an individuals's place of residence (i.e., rural or urban) and occupation, these three schemes differ considerably in terms of levels of premium, coverage of health services and reimbursement rates. Studies have found

that health care utilisation is significantly lower among the rural population enrolled in NCMS, as compared to the urban population enrolled in other types of SHIs (Meng et al., 2015). Significantly, the reimbursement rate was found to be 10% lower and service coverage, less comprehensive for NCMS, as compared to UEI and URI (*ibid.*).

Critically, the segmentation of SHI has led to considerable disparities in access to health care and financial protection across different sections of population. Studies have found that the NCMS had little impact on reducing out-of-pocket (OOP) payments among low income enrollees (You and Kobayashi, 2009; Yang and Wu, 2014); the URI scheme was also demonstrated to have driven up health costs without necessarily reducing OOP expenditures (Liu and Zhao, 2012).

<Table One about here>

<Panel One about here>

Since January 2016, the Chinese Government has begun to phase in the Urban and Rural Resident Medical Insurance (URRMI) scheme across different localities with the aim of merging both URI and NCMS and as a first step towards eventual integration of all existing SHI schemes under a single payer scheme in the near future. Establishing a unified SHI by 2020, with the aim to close the gap of rural/urban health disparity by improving the benefit packages for the rural subscribers, is one of the key priorities of China's health care reform (The State Council of People's Republic of China, 2016).

While it is typically assumed that unifying all SHI schemes to a single insurer system would help to reduce disparities in access and health costs across populations (Hussey and Anderson, 2003), the actual impacts of such unification, however, are far from certain based on the experiences of a number of countries (Atun et al., 2013; Economics Intelligence Unit, 2014; Cheng, 2003). While it is found that the

unification of five SHI schemes in Turkey in 2008 led to improved access to care, greater fairness in financing and increased user satisfaction (Atun et al., 2013), experiences in some other Asian countries indicated that the initial stages of SHI integration could be embroiled with fiscal challenges. Indonesia's National health Insurance Scheme – 'Jaminan Kesehatan Nasional' (JKN) – launched in January 2014 and aims to integrate various state-owned health insurance schemes into a single payer SHI, met with problems related to financial insolvency due to a surge in health care demand (Economics Intelligence Unit, 2014). Similarly, the expenditures of Taiwan's National Health Insurance (NHI), a government-run, single-payer health insurance scheme, outstripped its revenues during the first few years. Although the NHI has made health care more publicly accessible, a study has shown that some doctors in Taiwan tend to over-prescribe treatments covered by the NHI scheme to generate more revenue for the hospitals to then multiply their revenue streams (Cheng, 2003).

The recent policy development in China towards a unified SHI system offers a unique opportunity to study how the expansion and improvement of the benefit packages of SHI may influence health expenditures. Moving from the current system of the co-existence of multiple SHI schemes varying greatly in benefits to a unified system may entail enormous cost implications that have so far received little attention. Drawing data from the China Health and Retirement Longitudinal Study (CHARLS), this study aims to examine the impacts of the degree of generosity of different types of SHI on utilisation of health services, total health costs as well as out-of-pocket health costs. Insights derived from this study may not only contribute directly to the policy discourse on current policy reform in China towards a single insurer scheme, but also improve our understanding on the cost and benefit calculations of various policy options in reforming SHI systems as policy-makers in many developing

countries are grappling with the challenges in expanding SHI systems towards a more financially sustainable future (Reich, 2016; Hsiao and Shaw, 2007).

Methods

Data source

We drew data from the national survey of CHARLS for the years 2011 and 2013. Commissioned by the U.S. National Institute on Aging, the World Bank, and the National Natural Science Foundation of China, CHARLS is an ongoing, publicly available, internationally collaborative project that collects data from a nationally representative sample of Chinese residents aged 45 and above. This dataset is well suited for our analysis considering that older adults and elderly populations have a higher propensity for health services, and the subsequent impacts on health costs may have more pronounced effects on them as compared to the younger population. Twenty-eight provinces and autonomous regions varying substantially in terms of geography, economic development, public resources and health indicators were included in the survey. The first round of CHARLS data collection was conducted in 2011, and a follow-up survey was conducted in 2013.

Variable specifications

Dependent variables

The dependent variables chosen for our analysis are: (1) binary variables of the participation in inpatient and outpatient care conditioned upon the occurrence of inpatient (in the past 12 months) and outpatient (in the past four weeks) visits, and: (2) continuous variables of the total health costs and out-of-pocket (OOP) costs of the most recent inpatient (in the past 12 months) and outpatient (in the past four weeks) visits. Total costs were defined as total inpatient costs before insurance claims were

made; OOP costs were those paid by respondents after insurance claims were reimbursed. All costs were adjusted for inflation according to the Consumer Price Index (CPI) for health services in different provinces using 2011 as the base year (National Bureau of Statistics of China, 2013; National Bureau of Statistics of China, 2014).

Independent variables

The independent variables of interest for the present study are the SHI variables—UEI, URI, NCMS, URRMI and no insurance (individuals not enrolled in any health insurance schemes). Specifically, respondents were asked to report the type of insurance they had utilised for the most recent inpatient and outpatient visit.

Our analysis also controlled for a set of factors that may have influenced access/ costs of inpatient care. These included variables for health needs and for non-health needs among the sample population (Jones, 2007; O'Donnell et al., 2008). For health needs variables, our analysis controlled for individual variances that could affect health conditions such as age, gender, marital status, number of chronic diseases that an individual reported to have, and number of limitations in Activities of Daily Living (ADL) and Instrumental Activities of Daily Living (IADL). ADL refers to routine activities that an individual tends to do every day without needing assistance. There are six basic ADLs: eating, bathing, dressing, toileting, transferring (walking), and continence. IADL refers to the activities that allow individuals to live independently in the community. The IADLs reported in the survey are: doing household chores, preparing hot meals, buying groceries, managing finances and making phone calls. The number of self-reported ADLs and IADLs is the aggregate measure of the severity of daily activity limitations.

For non-health need factors, we controlled for a set of socioeconomic variables. Per capita household expenditure was adjusted by household size and the demographic composition of the household (i.e., number of adults and children) using the Equivalence Scale in the past one month (Citro and Michael, 1995) (continuous variable in logarithm function). Education (dummy variable), average per capita disposable income at the provincial level for year 2011 and 2013 (continuous variable), and region of residence (five geographical region dummies- North, Northeast, East, South Central, Southwest, and Northwest, with Northwest as the reference category) were included in the analysis.

We also controlled for health facilities which is a crucial supply-side factor that affects health utilisation and costs (Yang and Wu, 2014). Health facility variables were categorised into three groups (village clinics, community health centre and city hospitals) for outpatient analysis and two groups (village clinics, city hospitals) for inpatient analysis. Village clinics is the reference category. Table 2 provides summary statistics of the study sample.

<Table Two about here>

Empirical strategy

This study incorporated both descriptive and inferential analysis. Descriptive analysis entailed calculating the means and standard errors of the mean costs of inpatient and outpatient total costs as well as OOP costs across different health insurance utilisations.

Our inferential analysis involved modelling insurance variables to estimate the utilisation and costs of healthcare for individual participants who reported a history of inpatient visits within the last 12 months and outpatient visits within the last four weeks.

In particular, we estimated the determinants of inpatient care utilisation, total costs, and OOP costs for both inpatient and outpatient care using a Two-part model (2PM) (Jones, 2000; 2007; O'Donnell et al., 2008). The 2PM comprises firstly of a Probit Model to examine the probability of individual health insurance utilisation on whether the same individual had incurred any costs on a recent inpatient and/or outpatient visit as a proxy for health service utilisation, and second, an Ordinary Least Squares (OLS) model applied to determine the relationship between health insurance utilisation and health costs only to the population that incurred nonzero costs. We also included community fixed-effects with standard errors clustered at the community-level to account for heterogeneity across various urban and rural communities. This decision was guided by our assumption that there were unobserved factors at the community level that were correlated with other regressors in our model (Cameron and Trivedi 2005).

In modelling health care costs, both the 2PM and Heckman Selection Model (HSM) are frequently used to analyse limited dependent variables (Dow and Norton 2003; Norton et al. 2008). In our study, we chose to model both inpatient and outpatient utilisations and costs using 2PM. We had considered HSM but did not apply this model due to the following reasons. Theoretically, 2PM assumes that both seeking treatment and actual health costs incurred are independent and discrete decisions (Madden, 2008). On the contrary, HSM allows both decisions—seeking treatment, and health costs—to be influenced by distinct but correlated observable and unobservable factors (Jones, 2000; 2007). The potential health costs would have an impact on an individual's decision to seek treatment in the first place. Intuitively, both treatment seeking and health cost decisions for outpatient treatment are unlikely to be correlated as outpatient costs, relative to inpatient costs, and are less crucial in influencing an individual's

treatment decision. This is especially the case in China whereby inpatient treatment decision is highly correlated with socio-economic status, and its high cost could potentially deter populations, especially those from low socio-economic background, to seek treatment (Gong et al. 2016; Jiang et al. 2017). Considering this theoretical reasoning, 2PM is more suitable to model outpatient care utilisation and costs as opposed to HSM. We also performed statistical tests to determine whether 2PM is a better model than HSM by generating the inverse mills ratio (IMR) for HSM. The performance of HSM depends on the collinearity between the IMR, which was estimated from the Probit Model for the probability of seeking outpatient care, and the costs of outpatient care in the OLS regression model. The t-ratio test indicated that there was no collinearity between outpatient care decisions and costs, and the Spearman's rank-order correlation which is not statistically significant, suggested that there is no effect of selection. Our statistical tests substantiated our theoretical reasoning that 2PM is more suitable than HSM in modelling outpatient utilisations and costs in our analysis. For inpatient treatment, there is however a likelihood of the presence of unobserved factors that correlate both the decisions to seek treatment and health costs. This is due a common belief that inpatient costs are much higher than outpatient costs and may therefore hinder an individual's decision to seek treatment. Considering these latent factors, we could not conclude whether the zero inpatient costs were actual outcomes or missing potential outcomes due to an individual's reluctance to seek treatment (Dow and Norton, 2003). To make a statistical decision on which (2PM or HSM) is a better performing model for inpatient care utilisation and costs, we generated an inverse mills ratio (IMR) for HSM. The t-ratio test of this relationship indicated that there was no collinearity between an inpatient care decision and costs, and the Spearman's rank-order correlation indicated no effect on selection,

hence established that HSM was not the appropriate model for this analysis (Jones, 2007). Here, we reported only the results of the 2PM for inpatient analysis. Our model specifications are also guided by the fact that all parametric assumptions are reasonably fulfilled with histograms showing fairly normal distributions of all the cost data. For all analyses, the computation of a variance inflation factor (VIF) was performed, and results indicated that multi-collinearity was not a problem. Ramsey tests for linear regression models and Hosmer-Lemeshow tests for probit models were also performed, and results showed that our models did not have specification problems.

Results

We first compared the mean total costs and OOP costs among different SHI participants for both inpatient and outpatient care. Figure 1 shows the mean of total and OOP costs for individuals who utilised different health insurance schemes at the most recent inpatient visit over the last 12 months. Individuals who utilised UEI, which is the most generous health insurance scheme, reported mean total cost of RMB10,421.60 (USD1,562.45), as opposed to RMB4,707.00 (USD685.06) from individuals who had no health insurance. Individuals who utilised UEI, URI, URRMI and NCMS for their most recent inpatient visit reported a lower share of OOP costs as a percentage of total cost (38.9%, 54.7%, 65.6% and 56.3% respectively on average) as compared to their counterparts with no health insurance who paid 100% of the total cost out-of-pocket. Comparison of the mean total health costs for different SHI schemes also indicated that people who utilised UEI incurred significantly higher cost per inpatient episode as compared to people who utilised other SHI schemes and people with no insurance. Comparing the most recent outpatient visit cost for

individuals who utilised different health insurance scheme, Figure 2 shows that individuals who utilised URI incurred the highest mean cost (RMB1,863.60 or USD279.39), followed by URRMI (RMB1,475.40 or USD221.19) and UEI (RMB1,4071.10 or USD2,109.66). This is in contrast to relatively lower mean scores reported by individuals who utilised NCMS (RMB929.70 or USD139.40), and an even lower mean reported by individuals who had no health insurance (RMB317.00 or USD46.14). As for OOP costs for most recent outpatient visit, people who reported health insurance utilisation in their most recent outpatient visit also incurred lower share of OOP as a percentage of total cost as compared to individuals with no health insurance (39.4% for UEI utilisation; 53.2% for URI utilisation; 60.5% for NCMS utilisation and 62.6% for URRMI utilisation on average). Nevertheless, the relatively higher absolute out-of-pocket expenditures for health insurance enrollees as compared to individuals with no health insurance begets a follow up question as to whether health insurance enrollees have tendencies to seek more treatment in outpatient settings, hence incur higher absolute costs, as compared to people with no health insurance. If this holds true, the higher absolute costs could be perceived as desirable costs that are preventive in nature, potentially lowering the chance of seeking inpatient care in higher level facilities that are more exorbitant. If this does not hold true, it suggests that the financial protection effects of health insurance towards outpatient care could be limited. Previous studies also reported that health insurance schemes in China had not been able to reduce out of pocket payment among the enrollees (Wagstaff and Lindelow, 2008; Yang and Wu, 2014; Liu and Zhao, 2012). Our data does not allow us to decipher the underlying reason behind this trend. However, understanding the reasons behind the broad trends of higher absolute outpatient out-of-pocket

expenditures among health insurance enrollees would be an interesting and important question to undertake in the future.

<Figure One and Figure Two about here>

We subsequently attempted to disentangle the effects of different health insurance schemes of various generosity levels to both inpatient and outpatient care utilisations and health costs. We employed health insurance utilisation as the independent variable of interest. We reported the results of the 2PM estimating the effects of different health insurance schemes to an individual's decision to utilise both inpatient and outpatient treatment, as well as the incurrence of inpatient and outpatient costs by comparing total costs before insurance reimbursement with OOP costs after insurance reimbursement in Table Three.

Results showed that, *ceteris paribus*, all health insurance participants were associated with a higher likelihood to use inpatient care as compared to the uninsured. The results for UEI, URI and NCMS are statistically significant ($p < 0.01$). The magnitude of increase in using inpatient care for UEI, URI, an NCMS participants were 18.4%, 16.3% and 9.7% respectively as compared to the uninsured. Turning to the health costs, *ceteris paribus*, utilisations of UEI, NCMS and URRMI schemes were significantly associated with higher total inpatient costs prior to insurance reimbursement as compared to the uninsured. In particular, per episode total inpatient costs ran approximately 72.2% higher for UEI participants, 42.0% higher for NCMS participants and 57.5% higher for URRMI participants as compared to the uninsured, suggesting that more generous insurance is associated with higher health consumption for the users. Health insurance utilisations have no significant effects to out-of-pocket expenditures among all health insurance enrollees as compared to the uninsured.

In terms of outpatient care, the broad trend shows that across China, health insurance schemes appeared to have negative associations with the decisions to utilise outpatient care. UEI, URI and NCMS, for instance, indicated statistically significant reductions in probability of seeking outpatient care as compared to the uninsured. This finding may appear bizarre, but further analysis of the data shows that on average, only about half of the health insurance enrollees ended up using health insurance in their most recent outpatient visit.¹ This suggests that health insurance has less influence on making individual outpatient care decisions as compared to inpatient care decisions. Findings for the costs incurred for outpatient care consequent to SHI utilisations corresponded with those of inpatient care, with UEI and NCMS participants shown to be associated with significantly higher total outpatient costs as compared to the uninsured. There are no significant associations between all health insurance utilisations with outpatient out-of-pocket expenditures, except for NCMS utilisation, which was found to associate with significantly higher OOP outpatient costs (approximately 30.4%) as compared to the uninsured.

<Table Three about here>

We performed sensitivity analyses, replacing the control ‘number of limitations in ADLs and IADLs’ with ‘number of chronic diseases an individual reported to have’, a highly correlated variable, to check for robustness of our regression models. Our sensitivity analyses correspond with our main results.

Discussion and conclusion

This study sheds light on the relationships between health insurance generosities and health seeking behaviours, and the subsequent health costs incurred among the adult population aged 45 and above in China. UEI, the health insurance

scheme that endows its enrollees with the most generous benefits, tends to incur the highest total pre-reimbursement inpatient health costs than the other health insurance enrollees. The same situation in which the most generous SHI tends to incur the highest charges among patients with the same types of medical conditions has been reported in other countries such as Germany (Krobot et al., 2004) and Thailand (Ngorsuraches and Ungsopanit, 2004). In addition, studies conducted in the U.S. (Huttin, 2007), Korea (Suh et al., 2014), and Mexico (Rivera-Hernandez and Galarraga, 2015) also demonstrated that a patient's health insurance status did have some influence in determining their access to certain treatment regimens. Our findings suggest that more generous health insurance schemes such as UEI and URI tend to induce higher health consumption as compared to less generous health insurance schemes such as NCMS. The uninsured, likewise, incurred the lowest total mean health costs, which can be explained by their propensity to underutilise treatment due to lack of protection. Our findings point to a more marked effect of supplier-induced demand – a phenomenon that has been widely documented in China due to the profit-driven nature of providers in the public health care landscape (Yip and Hsiao, 2009; Zhang et al., 2015) - for individuals with more generous health insurance schemes.

In terms of OOP payments, the participation in SHI schemes did not result in statistically significant differences in OOP payments for its participants in outpatient care as compared to participants with no insurance. The reductions of OOP payments in inpatient care, were all insignificant. Moreover, NCMS utilisations were associated with significant increase in OOP payments for outpatient care. Consistent with previous studies examining the effects of China's SHI on financial protection to its enrollees, our findings provide limited support to the claim that participation in SHI would lead to a reduction in OOP payment. (Yang and Wu, 2014; You and Kobayashi,

2011). More important, while it is politically popular to make SHI more generous, it should not be taken for granted that more generous SHI schemes will reduce the financial burden of those insured. The NCMS participants, notably, have shown to receive hardly any financial protection in terms of OOP payment reductions.

The higher probability of inpatient care participation as opposed to outpatient care participation observed from the findings in this study is not entirely surprising. The higher tendency to favour inpatient care over outpatient care among the Chinese citizens is most likely a result of how health resources are historically allocated in China. A disproportionately higher medical investments have always been allocated to the second-tiered and third-tiered health care institutions such as big hospitals in the urban areas as compared to first-tiered health care institutions such as village health centres since the 1980s. This situation started at a time when free market economy became the central tenet in driving many areas of public policy reforms in China (Blumenthal and Hsiao 2015; Cheng et al 2017). Besides, there exists a sense of distrust toward the primary health system among the citizens (Cheng et al 2017), and also a stronger preference to choose higher-tiered health care institutions when deciding on treatment due to a general perception that these institutions are able to provide a higher quality of care (Hu et al 2016). Even though social health insurance expansion has been launched more than a decade ago and has been fairly effective in improving health access (Blumenthal and Hsiao 2015), findings from our study suggest that there is a need for more policy attention to be placed on strengthening outpatient care provision at the primary health system level.

Since the launch of URRMI by the Chinese government in early 2016, there has been a strong push to merge this with the UEI scheme at the prefecture (county) level in China as the first step towards unification (He and Wu, 2016). Our findings

have important policy implications for policy-makers in China and other developing countries that are contemplating a transition from a multiple-payer SHI system to a single payer SHI system that unifies all existing schemes. Contrary to conventional wisdom that a single payer SHI system that unifies all existing SHI schemes is more efficient (Hussey and Anderson, 2003), our findings suggest that a move towards a unified SHI scheme that is more generous than some of the existing SHI schemes may give rise to health expenditure escalation, which would result in cost burden to the government and individual participants, in part due to the perverse incentives inherent in the current fee-for-service provider payment system in China that reimburses health providers based on the quantity of services delivered. The over supplying of services and over prescribing of treatment have become norms in medical practices as means to generate additional revenues for the providers.

In recent years, various cost control measures, such as the separation of revenue generation responsibilities and expenditure systems in the health facilities, introducing more transparent pharmaceutical procurement systems, and implementing national standard clinical guidelines were proposed as tangible measures that could be taken at institutional level to contain health costs in China (Tang and Bekedam, 2012). The effectiveness of these measures in overcoming perverse incentives is of critical importance to the success of the unification of SHI.

Besides the above policy options, governance mechanisms ought to be strengthened alongside institutional design reforms in the SHI system. In most countries, strengthening the accountability structures to detect fraud and abuse is a pivotal step in cost control. Experience in Taiwan demonstrated that building a monitoring system to detect malpractice, and ensure cost sharing is enforced on the population who did not have to pay for health care previously, stood as an effective

check and balance in controlling cost (Lu and Hsiao, 2003). In addition, with the dramatic rise in public health expenditure as a percentage of total health expenditure in China from 33.6% in 2001 to 55.8% in 2014 (The World Bank, 2016), reconfiguring the incentive structures within the provider payment systems is another cost control measure that ought to be considered. Literature on provider payment system have generated a general consensus that controlling all other factors, prospective payment systems tend to contain cost better than retrospective payment systems (Jegers et al., 2002; Roberts et al., 2008). The Korean experience indicates that with increased health access and rising health demand under a unified SHI system, a shift towards a prospective provider payment system is inevitable (Kwon, 2009). A recent study that assessed three cities in China piloting mixed provider payment methods indicated that both a prospective (capitation and global budget) and retrospective (fee-for-service, case-based payment and unit flat rate) financing mix showed positive impacts on the cost control of health care (Tang and Bekedam, 2012). These positive outcomes indicate that a gradual shift in provider payment system from the current fee-for-service provider payment method to prospective system such as capitation and global budget in China is the way forward.

As China moves towards the eventual policy goal of integrating SHI schemes into a unified system, many institutional design aspects of unification, which include resetting acceptable premium rates to different segments of the population, optimising cost-sharing levels in the form of deductibles and co-payments, and standardising service provisions across the country, warrant careful deliberations (Meng et al., 2015; Yu, 2015). Likewise, an SHI system that ensures social solidarity necessitates the rich to subsidise the poor. Doing this without causing political backlash requires savvy political acumen. Over time, the government needs to find ways to effectively enhance

premium revenue collection - especially from the self-employed and informal sector employees - to ensure political and fiscal sustainability of the system (Hsiao and Shaw, 2007). A unified SHI system that strictly observes cost containment also requires the government to effectively command its monopsony power and strategic purchasing. Solutions towards the challenges above, however, are beyond the scopes of this study.

This study possesses two limitations. While demonstrating that more generous health insurance schemes lead to higher total health costs, such a relation is at most associative. We acknowledge that there might be both observed and unobserved heterogeneities in terms of the design of different SHI schemes across different Chinese localities, and we have attempted to address this by incorporating regional controls and community fixed-effects to account for geographical heterogeneities in our analysis. Besides, we acknowledge the limitation of using self-reported household survey data for our analyses, which could be subject to reporting bias. Our study provides an initial insight into the implication of a unified SHI system in China. Moving forward, the examination of the mechanisms that drive-up health costs for different SHI schemes would be a meaningful research endeavour. Understanding this could provide more profound policy insights to the policy-makers in the face of ongoing SHI reform and expansion in China.

Endnote:

¹ Details of this analysis are available upon request.

References:

Atun, R., Aydin S., Chakraborty S., Sumer S., Aran M., Guerol I., Nazlioglu S., Ozgulcu S., Aydogan U., Ayar B., Dilmen U., and Akdag R. (2013),

- ‘Universal Health Coverage in Turkey: Enhancement of Quality’, *Lancet*, 382(9886): 65-99.
- Barber, S. L., and Yao L. (2010), ‘Health Insurance Systems in China: A Briefing Note. *World Health Report*’, [online] Available at: http://www.who.int/healthsystems/topics/financing/healthreport/37ChinaB_Y_FINAL.pdf [Accessed 26 Sept 2016]
- Blumenthal, D., and Hsiao W. (2015), ‘Lessons from the East—China's Rapidly Evolving Health Care System’, *New England Journal of Medicine*, 372(14):1281-1285.
- Cameron, A.C., and Trivedi P.K. (2005), *Microeconometrics: Methods and Applications*. New York: Cambridge University Press.
- Cheng, T.M. (2003), ‘Taiwan's New National Health Insurance Program: Genesis and Experience So Far’, *Health Affairs*, 22(3): 61-76.
- Cheng, J.M., Yuan Y.X., Lu W. and Yang L. (2017), ‘Primary Health Care in China: Is China's Health Reform Reform for the Whole Nation?’, *Primary Health Care Research & Development*, 18: 398-403.
- Citro, C.F., and Michael R.T. (1995), *Measuring Poverty: A New Approach. Panel on Poverty and Family Assistance: Concepts, Information Needs, and Measurement Methods*. Washington DC: National Academy Press.
- Dow, W.H. and Norton E.C. (2003), ‘Choosing Between and Interpreting the Heckit and Two-part Models for Corner Solutions’, *Health Services and Outcomes Research Methodology*, 4(1): 5-18.
- Economics Intelligence Unit (2014), ‘Indonesia Launches Universal Healthcare’, Homepage of Economics Intelligence Unit, [online]. Available at:

- <http://www.eiu.com/industry/article/1071418091/indonesia-launches-universal-healthcare/2014-01-13> [Accessed 17 Feb 2016].
- Gong, C.H., Kendig, H. and He, X. (2016), 'Factors Predicting Health Services Use Among Older People in China: An Analysis of the China Health and Retirement Longitudinal Study 2013', *BMC health services research*, 16(1): 63.
- He, A. J. W., and Wu, S.L. (2016), 'Towards Universal Health Coverage via Social Health Insurance in China: Systemic Fragmentation, Reform Imperatives, and Policy Alternatives', *Applied Health Economics and Health Policy*, 1–10.
- Hsiao, W., and Shaw R. P. (2007), *Social Health Insurance for Developing Nations*. World Bank Publications.
- Hu, R., Liao Y., Du Z., Hao, Y., Liang, H. and Shi, L. (2016), 'Types of Health Care Facilities and the Quality of Primary Care: A Study of Characteristics and Experiences of Chinese Patients in Guangdong Province, China', *BMC Health Services Research*, 16(1): 335.
- Hussey, P, and Anderson G.F. (2003), 'A Comparison of Single- and Multi-payer Health Insurance Systems and Options for Reform', *Health Policy* 66(3): 215–28.
- Huttin, C. (2007), 'The Role of Different Types of Health Insurance on Access and Utilization: Comparative Results on Two Chronic Conditions (Hypertension and Diabetes Type II Without Complication)', *Managerial and Decision Economics* 28(4–5): 503–7.
- Jegers, M., Kesteloot K., Graeve D.D., and Gilles, W. (2002), 'A Typology for Provider Payment Systems in Health Care', *Health Policy* 60(3): 255–73.

- Jiang, Y., Wang Y., Li Y., Zhang Y., Zhao Y., Wang X., Ma C. and Ma S. (2017), 'Inpatient Treatment for the Middle-aged and Elderly in Central China', *Frontiers in public health*, 5:7.
- Jones, A.M. (2000), 'Health Econometrics', in A.J. Culyer and J.P. Newhouse (eds), *Handbook of Health Economics*. Amsterdam ; Oxford: Elsevier.
- Jones, A.M. (2007), *Applied Econometrics for Health Economists: A Practical Guide*. York, United Kingdom: Radcliffe Publishing.
- Krobot, K. J., Miller, W.C., Kaufman, J.S., Christensen, D.B., Preisser, J.S., and Ibrahim, M.A. (2004), 'The Disparity in Access to New Medication by Type of Health Insurance: Lessons from Germany', *Medical Care* 42(5): 487–91.
- Kwon, S. (2009), 'Thirty Years of National Health Insurance in South Korea: Lessons for Achieving Universal Health Care Coverage', *Health Policy and Planning* 24(1): 63–71.
- Liu, H. and Zhao, A. (2012), 'Impact of China's Urban Resident Basic Medical Insurance on Health Care Utilization and Expenditure', [online] Available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2157910 [Accessed 20 Jul 2016]
- Lu, J.F.R. and Hsiao, W.C. (2003), 'Does Universal Health Insurance Make Health Care Unaffordable? Lessons from Taiwan', *Health Affairs*, 22(3): 77-88.
- Madden, D. (2008), 'Sample Selection versus Two-part Models Revisited: The Case of Female Smoking and Drinking', *Journal of Health Economics*, 27(2): 300-307.

- Meng, Q., Fang H., Liu, X., Yuan, B., and Xu, J. (2015), ‘Consolidating the Social Health Insurance Schemes in China: Towards an Equitable and Efficient Health System’, *The Lancet* 386(10002): 1484–1492.
- National Bureau of Statistics of China (2013), ‘China Statistical Yearbook 2013’, [online] Available at: <http://www.stats.gov.cn/tjsj/ndsj/2013/indexeh.htm> [Accessed 17 Feb 2016]
- National Bureau of Statistics of China (2014), ‘China Statistical Yearbook 2014’, [online] Available at: <http://www.stats.gov.cn/tjsj/ndsj/2014/indexeh.htm> [Accessed 17 Feb 2016]
- National Health and Family Planning Commission of China (2014), *China Health Statistical Yearbook 2013*. Beijing, P.R.China: National Health and Family Planning Commission, P.R.China.
- Ngorsuraches, S., and Ungsupanit, J. (2004), ‘The relationship Between Health Insurance Type and Costs of Prescribed Drugs’, *Value in Health* 7(6): 651.
- Norton, E.C., Dow, W.H., and Do, Y.K. (2008), ‘Specification Tests for the Sample Selection and Two-part Models’, *Health Services and Outcomes Research Methodology*, 8(4): 201-208.
- O’Donnell, O., Van Doorslaer, E., Wagstaff, A., and Lindelow, M. (2008), *Analyzing Health Equity Using Household Survey Data : A Guide to Techniques and Their Implementation*. Washington, D.C.
- Reich, M.R., Harris, J., Ikegami, N., Maeda, A., Cashin, C., Araujo, E.C., Takemi, K., and Evans, T.G. (2016), ‘Moving Towards Universal Health Coverage: Lessons from 11 Country Studies’, *The Lancet*, 387(10020): 811-816.

- Rivera-Hernandez, M., and Galarraga, O. (2015), 'Type of Insurance and Use of Preventive Health Services among Older Adults in Mexico', *Journal of Aging and Health*, p. 0898264315569457.
- Roberts, M. J., Hsiao, W. Berman, P., and Reich, M.R. (2008), *Getting Health Reform Right: A Guide to Improving Performance and Equity*. New York: Oxford University Press.
- Suh, H. S., Kang, H.Y., Kim, J., and Shin, E. (2014), 'Effect of Health Insurance Type on Health Care Utilization in Patients with Hypertension: A National Health Insurance Database Study in Korea', *BMC Health Services Research* 14(1): 570.
- Shen, S.G. (2014), 'Critical Reflections on the Unification and Consolidation of SHI Schemes in China (in Chinese)', *Xuehai*, 1:52-58.
- Tang, S., Tao, J., and Bekedam, H. (2012), 'Controlling Cost Escalation of Healthcare: Making Universal Health Coverage Sustainable in China', *BMC Public Health*, 12(1): 1-13.
- The State Council of P. R. China, 2016. *The State Council's opinions on the Unification of Social Health Insurance in Rural and Urban China (in Chinese)*. Third edition. Beijing, China: The State Council of P.R. China.
- Wagstaff, A., and Lindelow, M. (2008), 'Can Insurance Increase Financial Risk? The Curious Case of Health Insurance in China', *Journal of Health Economics* 27(4): 990–1005.
- Wang, X., Zheng, A., He, X., and Jiang, H. (2014), 'Integration of Rural and Urban Healthcare Insurance Schemes in China: An Empirical Research', *BMC Health Services Research*, 14(1): 1-10.

- Xinhua (2012), 'Report on the Work of the Chinese Government. Xinhua News', [online] Available at: http://news.xinhuanet.com/english/china/2016-03/17/c_135198880.htm [Accessed 20 Jul 2016].
- Xinhua (2016), 'China Moves Ahead with Medical Insurance Merger for Urban, Rural Equality. Xinhua News', [online] Available at: http://news.xinhuanet.com/english/2016-01/12/c_135002236.htm [Accessed 20 Jul 2016].
- Yang, W., and Wu, X. (2014), 'Paying for Outpatient Care in Rural China: Cost Escalation under China's New Co-Operative Medical Scheme', *Health Policy and Planning* 2014.
- Yip, W. and Hsiao, W. (2009). 'China's Healthcare Reform: A Tentative Assessment', *China Economic Review* 20(4): 613-619.
- You, X., and Kobayashi, Y. (2009). 'The New Cooperative Medical Scheme in China', *Health Policy* 91(1): 1–9.
- Yu, H. (2015), 'Universal Health Insurance Coverage for 1.3 billion People: What Accounts for China's Success?', *Health Policy* 119(9) : 1145–1152.
- Zhang, H., Hu, H., Wu, C., Yu, H., and Dong, H. (2015). 'Impact of China's Public Hospital Reform on Healthcare Expenditures and Utilization: A Case Study in ZJ Province', *PLoS ONE* 10(11): e0143130.

Table One: Key features of NCMS, UEI, URI and URRMI

	NCMS	UEI	URI	URRMI
Date started	2003 (Pilot scheme was initiated in four provinces)	1998 (pilot scheme was initiated in 1994)	Pilot since 2007	Rolled out in phases since January 2016
Target population	Rural residents	Urban employee	Urban residents without formal employment	Urban residents without formal employment and rural residents
Enrollment	Participation is usually voluntary at household level but could be enforced once the county joins the NCMS.	Participation is mandatory for all urban residents with formal employment.	Voluntary (household level)	Voluntary
Coverage	805 million rural population	271 million urban employees	264 million urban residents	Those who are not covered under the UEI scheme
Risk pooling	County level	City level	City level	County level
Reimbursement rate, ceiling and deductibles	Deductibles, reimbursement rates, and ceilings are set by the county governments. The rates depend largely on the types of health providers.	Deductibles, reimbursement rates, and ceilings are set by the city government. The rates depend largely on the types of health providers.	City government sets the reimbursement rate, ceilings, and deductibles. However, deductibles, reimbursement rates, and ceilings are different for children, elderly, and other urban residents. These rates also depend on the types of health providers.	Deductibles, reimbursement rates, and ceilings are set by the county governments. The rates depend largely on the types of health providers.
Financing mechanism	In western and central China, the central government	A total of 8% of employees' monthly payroll needs	In general, an annual premium provided by	In the preliminary phase, financing

	<p>assisted the local government in providing finance for the scheme. In the more affluent eastern and coastal regions, financing the premium was mainly through local governments. Government subsidies increased from 42.1RMB in 2005 to 308.5RMB in 2012.</p>	<p>to be contributed to the scheme, with the employee paying 2% and the employer paying the remaining 6%.</p>	<p>the government should be no less than 40RMB per year per person. In addition, the government provide extra subsidies to the disabled children, children from poor families, poor disabled elderly above 60. Insured urban residents who live in affluent provinces are likely to receive better benefit packages compared with those who live in less affluent provinces.</p>	<p>mechanism differs in each county. Generally, premiums are financed via a combination of self-contribution and government subsidies.</p>
Designated health facilities	All levels of public health facilities.	All levels of public health facilities.	All levels of public health facilities.	All levels of public health facilities.
Covered services	Inpatient services, catastrophic outpatient services, some prevention care services.	Inpatient services catastrophic outpatient services, some prevention care services.	Mainly cover inpatient services and catastrophic outpatient services.	Inpatient services (up to 75%) and outpatient services.

Sources: Barber and Yao 2010; Shen 2014; Meng et al. 2015

Table Two: Summary statistics

		Inpatient (N=1,309)		Outpatient (N=2,467)	
Variable	Definitions	Mean	Std. Dev.	Mean	Std. Dev.
<u>Health Insurance utilisation</u>					
UEI	Dummy variable: 1, UEI; 0 otherwise	0.206	0.404	0.096	0.295
URI	Dummy variable: 1, URI; 0 otherwise	0.052	0.222	0.016	0.126
NCMS	Dummy variable: 1, NCMS; 0 otherwise	0.661	0.474	0.330	0.470
URRMI	Dummy variable: 1, URRMI; 0 otherwise	0.020	0.138	0.008	0.089
No insurance	Dummy variable: 1, No insurance; 0 otherwise	0.062	0.241	0.549	0.498
<u>Demographics</u>					
Male	Dummy variable: 1, male; 0 female	0.528	0.499	0.428	0.495
Age	Continuous variable: age of the respondent	61.63	9.82	60.24	9.93
Education	Dummy variable: 1, has formal education; 0, no formal education	0.753	0.431	0.716	0.451
Married	Dummy variable: 1, married; 0, single or divorced	0.804	0.397	0.851	0.356
Household per capita expenditure	Continuous variable: inflation-adjusted per capita household expenditure	25731.43	33333.14	20807.14	32769.21
<u>Functional & health status</u>					
# of ADLs and IADLs	Count variable: number of limitations in activities of daily living (ADL) and instrumental activities of daily living (IADL)	0.598	1.595	0.522	1.471
<u>Medical facilities</u>					
Hospital	Dummy variable: 1, hospital; 0 otherwise	0.804	0.397	0.358	0.480
Community health centre	Dummy variable: 1, community health centre; 0 otherwise	0.196	0.397	0.295	0.456
Village health centre	Dummy variable: 1, village health centre; 0 otherwise	-	-	0.338	0.473
<u>Health costs</u>					
Total cost per episode (inpatient)	Continuous variable: total inpatient cost for the most recent visit in the past 12 months	7700.30	9668.44	-	-
OOP cost per episode (inpatient)	Continuous variable: OOP inpatient cost for the most recent visit in the past 12 months	4714.46	6665.86	-	-
Total cost per episode (outpatient)	Continuous variable: total outpatient cost for the most recent visit in the past 1 month	-	-	580.23	1290.55

OOP cost per episode (outpatient)	Continuous variable: OOP outpatient cost for the most recent visit in the past 1 month	-	-	392.23	847.68
<u>Regional characteristics and year</u>					
Provincial disposable income	Continuous variable: average disposable income at provincial level	15050.88	8630.94	13953.73	9055.15
Region: north	Dummy variable: 1, north; 0 otherwise	0.111	0.315	0.103	0.304
Region: northeast	Dummy variable: 1, northeast; 0 otherwise	0.083	0.276	0.046	0.210
Region: east	Dummy variable: 1, east; 0 otherwise	0.237	0.425	0.296	0.457
Region: south central	Dummy variable: 1, south central; 0 otherwise	0.267	0.442	0.262	0.440
Region: southwest	Dummy variable: 1, southwest; 0 otherwise	0.206	0.404	0.211	0.408
Region: northwest	Dummy variable: 1, northwest; 0 otherwise	0.087	0.283	0.072	0.258
Year	Dummy variable: 1, 2011; 0, 2013	0.544	0.498	0.732	0.443

Table Three: Two-Part Model for treatment utilisation and costs (inpatient and outpatient)

VARIABLES	Inpatient Care			Outpatient Care		
	Participatio n	Total costs	OOP costs	Participatio n	Total costs	OOP costs
UEI	0.743*** (0.181)	0.722*** (0.208)	-0.243 (0.257)	-0.798*** (0.152)	1.053*** (0.254)	0.187 (0.266)
URI	0.658*** (0.237)	0.281 (0.280)	-0.224 (0.278)	-0.776*** (0.245)	0.609 (0.600)	-0.006 (0.507)
NCMS	0.393*** (0.132)	0.420** (0.173)	-0.024 (0.189)	-0.378*** (0.100)	0.750*** (0.100)	0.304*** (0.095)
URRMI	0.316 (0.282)	0.575* (0.320)	0.169 (0.344)	-0.143 (0.366)	0.447 (0.446)	0.020 (0.428)
Constant	-0.794 (1.529)	-1.623 (3.006)	4.037 (3.481)	4.583*** (1.687)	19.958 (25.133)	35.455 (24.254)
Observations	1,605	1,327	1,327	2,684	2,488	2,488
R-squared	-	0.580	0.528	-	0.511	0.479
Community fixed-effects	-	Yes	Yes	-	Yes	Yes
Regional controls	Yes	-	-	Yes	-	-

Notes:

- The probit model for health service utilisation controls for individual characteristics (gender, age, age-square, education, marital status), individual economic status (per capita household consumption expenditure), individual health and functional status (total number of activities of daily living (ADL) and instrumental activities of daily living (IADL) that one has difficulty with), level of health facilities, and regional characteristics (average provincial disposable income and regional dummies), with survey year 2011 as the reference.
- The OLS model for total costs and OOP costs controls for individual characteristics (gender, age, age-square, education, marital status), individual economic status (per capita household consumption expenditure), individual health and functional status (total number of activities of daily living (ADL) and instrumental activities of daily living (IADL) that one has difficulty with), level of health facilities, and regional characteristics (average provincial disposable income), with survey year 2011 as the reference. Community-fixed effects with standard errors clustered at the community-level were included in the model.
- * indicates significant at the 10% level; ** indicates significant at the 5% level; *** indicates significant at the 1% level.
- Sensitivity analyses replaced a control ‘number of limitations in ADLs and IADLs’ with ‘number of chronic diseases one reported to have’ as alternative to control for individual health and functional status.
- The full main results and sensitivity analyses are available at online appendix.

Panel One: Types of Social Health Insurance Schemes in China

• Urban Employee Insurance (UEI)

UEI is compulsory for all employees and their employers in the formal urban sector. The insurance premium is set at 8% of each employee's monthly wage, comprised of a 2% contribution from the employee and the remaining 6% from the employer. The expansion of UEI has been rapid and remarkable: participation increased from 118 million urban employees in 2005 to 271 million in 2012 (National Health and Family Planning Commission of China 2014). UEI has the most generous benefit package among the three SHI schemes.

• Urban Resident Insurance (URI)

The URI covers urban residents who are not employed in the formal sector (the self-employed, unemployed, old/retired, young children and primary and secondary school students) and is a voluntary enrolment scheme, where government subsidies have been used to encourage increased participation. The enrolment increased from 118.2 million in 2008 to 271.2 million as of 2012 (National Health and Family Planning Commission of China 2014).

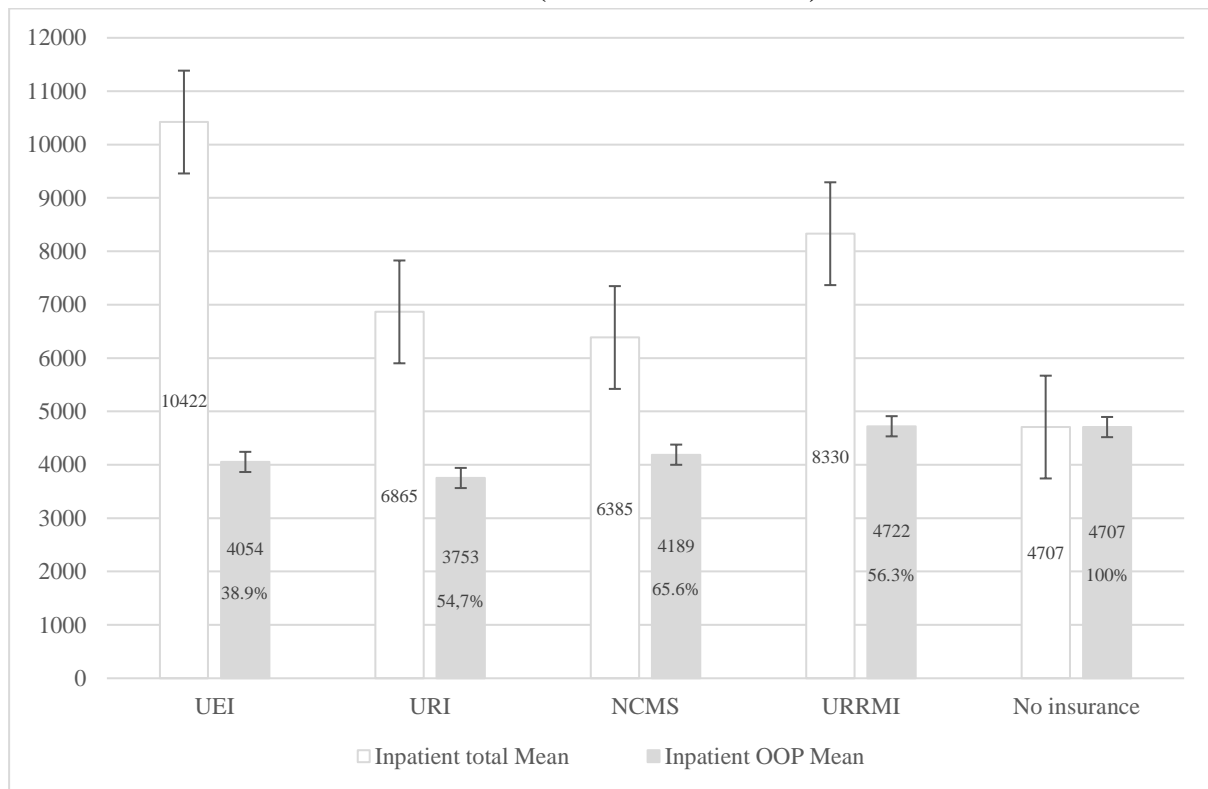
• New Rural Cooperative Medical Scheme (NCMS)

The majority of the rural population has been covered by NCMS since 2003. Subsidised largely by central and local governments, NCMS is administrated at county level, and the individual participant's contribution to the premium is kept relatively low. NCMS coverage soon became a key performance indicator for prominent government officials. The benefit package of NCMS, rudimentary at the outset, has become more comprehensive over time largely due to a massive injection of government subsidies: annual government contribution to insurance premiums increased from 42.1RMB in 2005 to 308.05RMB in 2012. Since 2007, NCMS benefits have expanded, at first mainly covering catastrophic illnesses, but now including outpatient and preventive care (Xinhua 2012).

• Urban and Rural Resident Medical Insurance (URRMI)

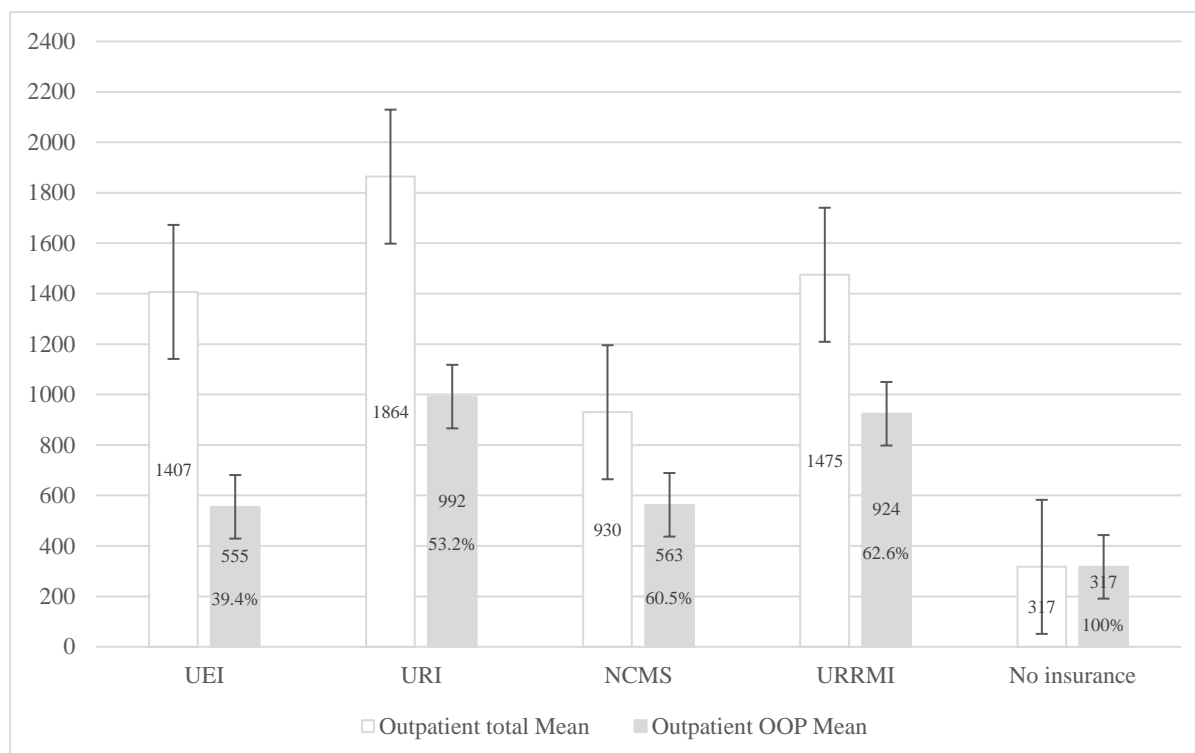
URRMI was piloted in a few cities and has been rolled out in phases since January 2016. It was first established with the intention of integrating URI and NCMS schemes as the premiums of both schemes are heavily subsidised by the government, unlike UEI, which is contributory. URRMI is considered as the first move of the larger government initiative to integrate all existing SHI schemes under a single payer scheme in the near future (Xinhua 2016).

Figure One: Comparison of the mean of most recent inpatient total and OOP costs across different health insurance schemes (mean/standard error)



Note: ¹ % indicates percentage of inpatient OOP mean cost out of inpatient total mean cost. ² All costs are measured in Chinese RMB.

Figure Two: Comparison of the mean of most recent outpatient total and OOP costs across different health insurance schemes (mean/standard error)



Note: ¹ % indicates percentage of outpatient OOP mean cost out of outpatient total mean cost. ² All costs are measured in Chinese RMB.